Attachment 1

Potential Use by Sensitive Species at Habitats Within and Surrounding Facilities at the Idaho National Engineering and Environmental Laboratory

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Potential Use by Sensitive Species of Habitats Within and Surrounding Facilities at the Idaho National Engineering and Environmental Laboratory:

A Biological Assessment

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Potential Use by Sensitive Species of Habitats Within and Surrounding Facilities at the Idaho National Engineering and Environmental Laboratory: A Biological Assessment

Executive Summary

In order to determine the potential for sensitive species to make use of potentially contaminated areas near facilities on the Idaho National Engineering and Environmental Laboratory (INEEL), we conducted a limited biological assessment for selected threatened, endangered, or otherwise regulatory sensitive species which might use areas in and around INEEL Waste Area Groups (WAGs). This document describes the protocols used and results from this assessment.

The protocols used in the surveys were developed by Foundation staff and University Affiliates, each of whom is an expert in the species under consideration. The surveys of areas outside facility fences were conducted in late summer 1996 by these investigators and their graduate students. *Individual sites of concern* within the boundaries of WAGs 1-7, 9, and 10 were independently assessed for potential habitat during summer 1996, summer 1997, and summer 1999. These surveys were conducted by Foundation staff members, University Affiliates, and Lockheed Martin Idaho Technology Company staff members.

The protocols incorporate a two-phased approach: a brief habitat survey to determine whether the species of interest is potentially present followed, if warranted, by a more intensive search for evidence of the species. In some cases, the first phase could be skipped based on current knowledge about the habitat or behavior of the species in question. In other cases, the second phase was inappropriate because evidence of the species would not have been expected to occur during late August and early September, when the assessment was done. In these cases, habitat surveys were not always appropriate and the entire assessment might have consisted of a literature search. The protocols for each species group reflect these contingencies.

For each species of concern, we discuss the applicability of the results to seasons and locations other than those in which the survey was conducted and the potential for future use of the survey sites by the species.

Results are reported on a WAG-by-WAG basis because this was determined to be most useful to the anticipated audience, WAG managers. Within each WAG section, results are reported on a species-by-species basis. In addition, there is an INEEL-wide summary. Finally, a report on the *individual sites of concern* within WAGs 1-7, 9, and 10 is included.

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Introduction

This document describes the protocols used and results from a limited biological assessment for selected threatened, endangered, or otherwise regulatory sensitive species which might use areas in and around Waste Area Groups (WAGs) at the Idaho National Engineering and Environmental Laboratory (INEEL) (Table 1). This assessment was prompted by the need to determine the potential for sensitive species to make use of potentially contaminated areas near facilities on the INEEL. Although the project was funded by the WAG 10-04 Ecological Risk Assessment group of Lockheed Martin Idaho Technologies Company (LMITCO), the information in this report will be useful for Ecological Risk Assessors as well as for biologists who are attempting to determine potential locations of these species on site.

In order to minimize repetition, the document is organized by species. However, because the primary audience for this report is interested in the potential for sensitive species to come into contact with pollutants from specific WAGs, I have addressed specific findings from each WAG under each species. Summary tables for the entire INEEL, broken down by WAG, are found following the species results.

For ease of reference, the protocols used in the surveys are described, by species, in a separate section. The surveys of areas outside facility fences were conducted in late summer 1996. Thus, the protocols reflect the expected seasonal responses of the species under consideration. The areas inside facility fences were independently assessed for potential habitat during summer 1996, and summer 1997.

The protocols used in this survey were developed by Foundation staff and University Affiliates (Table 2). The same people and their graduate students completed the work and analyzed the results. In addition, Ms. Nancy Hampton, LMITCO, organized and participated in the surveys inside facility fences.

Survey Protocols

This section describes the methodologies used in a limited biological assessment for selected threatened, endangered, or otherwise regulatory sensitive species which might use areas in and around WAGs at the INEEL. These protocols were developed by staff or University Affiliates of the Environmental Science and Research Foundation. Each of these investigators is experienced in locating and identifying the species for which they developed the protocol (Table 2).

The protocols incorporate a two-phased approach: a brief habitat survey to determine whether the species of interest is potentially present followed, if warranted, by a more intensive search for evidence of the species. In some cases, the first phase could be skipped based on current knowledge about the habitat or behavior of the species in question. In other cases, the second phase was inappropriate because evidence of the species would not have been expected to occur during late August and early September, when the assessment was done. In these cases, habitat surveys were not always appropriate and the entire assessment might have consisted of a literature search. The protocols for each species group reflects these contingencies.

Each of the protocols includes discussions of the Purpose, Scope, and Limitations of the protocol, and descriptions of the Screening and Survey Methodologies.

Burrowing Owl

Information obtained during studies of nesting burrowing owls on the INEEL in 1996 or earlier (Gleason 1978) was used to assess potential use of WAGs by burrowing owls. Sixteen burrows were located in 1996 and we measured vegetation characteristics of the habitat

Table . Facilities included in the Waste Area Groups (WAGs) on the Idaho National Engineering and Environmental Laboratory. WAGs include areas within the facility fences as well as areas immediately outside the fences where waste operations connected to the facilities have been conducted. More details can be found in the Action Plan within the 1991 Federal Facility Agreement and Consent Order between the State of Idaho Department of Health and Welfare, the U.S. Environmental Protection Agency, and the U.S. Department of Energy, Idaho Operations Office.

WAG	Facilities
WAG 1	Test Area North (TAN) including the Technical Support Facility (TSF), Initial Engine Test (IET) Facility, Loss of Fluid Test (LOFT) Facility, Specific Manufacturing Capabilities (SMC) Facility, and the Water Reactor Research Test Facility (WRRTF).
WAG 2	Test Reactor Area (TRA).
WAG 3	Idaho Chemical Processing Plant (ICPP).
WAG 4	Central Facilities Area (CFA).
WAG 5	Power Burst Facility (PBF) and Auxiliary Reactor Area (ARA) including the areas within and surrounding the historic Special Power Excursion Reactor Test (SPERT) facilities.
WAG 6	Experimental Breeder Reactor No. I (EBR-I) and Boiling Water Reactor Experiment (BORAX) areas.
WAG 7	Radioactive Waste Management Complex (RWMC) including the Transuranic Storage Area (TSA) and the Subsurface Disposal Area (SDA).
WAG 8	Naval Reactors Facility (NRF). This WAG was not included in these surveys.
WAG 9	Argonne National Laboratory - West (ANL-W).
WAG 10	Miscellaneous surface sites and liquid disposal areas throughout the INEEL that are not included in other WAGs including the Snake River Plain aquifer. Specifically identified sites include the Liquid Corrosive Chemical Disposal Area (LCCDA) located between WAGs 6 and 7, the Organic Moderated Reactor Experiment (OMRE) located between WAGs 4 and 5, and former ordnance areas, including the Naval Ordnance Disposal Area (NODA) located at numerous sites.

at burrow sites. Characteristics of these sites on the INEEL, along with general information in the literature on suitable nesting habitat for burrowing owls in the intermountain region, was used to evaluate potential nesting habitat in a 200-m wide peripheral area associated with WAGs. Location of active nesting sites is not possible in late summer because young have already fledged and moved away from nesting burrows.

Purpose and Scope

This survey protocol provided a method of assessing potential burrowing owl nesting habitat within 200 m of WAG perimeters based on characteristics we have observed around known nests on the INEEL as well as on other nesting literature from the intermountain region. We did not attempt to estimate the value of perimeter habitat as hunting areas for burrowing owls because of lack of information on this aspect for the INEEL; information is also scarce in the

Table . Assessment protocols, protocol developers, and species investigated by each protocol developed for a limited Biological Assessment for selected threatened, endangered, or otherwise regulatory sensitive species which might use areas in and around Waste Area Groups at the Idaho National Engineering and Environmental Laboratory.

Protocol	Developer	Species Investigated
Burrowing owl	Dr. Les Flake	burrowing owl (*Athene cunicularia*)
Raptors	Dr. Les Flake	bald eagle (*Haliaeetus leucocephalus*), peregrine falcon (*Falco peregrinus*), ferruginous hawk (*Buteo regalis*), northern goshawk (*Accipiter gentilis*)
Breeding birds	Dr. Randall C. Morris[1]	trumpeter swan (*Cygnus buccinator*), black tern (*Chlidonias niger*), loggerhead shrike (*Lanius ludovicianus*), long-billed curlew (*Numenius americanus*), raptors listed above
Sagebrush lizard	Dr. Chuck Peterson	northern sagebrush lizard (*Sceloporus graciosus*)
Bats	Dr. Duke Rogers	Townsend's big-eared bat (*Corynorhinus townsendii*), long-eared myotis (*Myotis evotis*), small-footed myotis (*M. ciliolabrum*), western pipistrelle (*Pipistrellus hesperus*)
Merriam's shrew	Dr. Duke Rogers	Merriam's shrew (*Sorex merriami*)
Gray wolf	Dr. Jim Peek	gray wolf (*Canis lupus*)
Pygmy rabbit	Dr. John Laundré	pygmy rabbit (*Brachylagus idahoensis*)
Plants	Mr. Jim Glennon	Lemhi milkvetch (*Astragalus aquilonius*), plains milkvetch (*A. gilviflorus*), winged-seed evening primrose (*Camissonia pterosperma*), spreading gilia (*Ipomopsis polycladon*)

[1]Protocols for breeding bird surveys were not developed for this assessment but are, instead, long established and well accepted. Dr. Morris summarized the results from this survey on the INEEL.

literature regarding hunting habitat in desert ecosystems. We did not attempt to survey actual numbers of owls because young had already fledged and dispersed from their nesting areas during the late summer survey period. We were prepared to record incidental sightings of burrowing owls, if they occurred, during the habitat surveys. Breeding bird survey data were also evaluated to determine if burrowing owls have been sighted near WAGs. We did not survey potential nesting burrows because of the ephemeral nature of burrows (fill with soil etc.) and because of the limited time available for such surveys.

Limitations

The best burrowing owl nesting habitat on the INEEL is probably not optimal for the species in the intermountain region. For our purpose, we defined optimal nesting habitat as optimal for the INEEL (the highest densities of burrowing owl nests we have observed on the INEEL). Densities of nesting burrowing owls on the INEEL are relatively low. Because of the time of year at which these surveys were conducted, inferences on nesting potential were based on known nest sites on the INEEL from our current studies and on the literature. Nesting surveys using taped calls and call backs and direct search need to be conducted in the spring and early summer and could not be conducted during this late summer survey.

We have no data on minimal size habitat areas acceptable to burrowing owls on the INEEL; we have assumed 1 ha as a minimal area because all of our nesting sites on the INEEL are in patches larger than 1 ha. It is possible we will find burrowing owls nesting in patches of habitat smaller than 1 ha in the future.

Information on home range size is needed to estimate potential hunting areas but is not available for the INEEL and the data from the literature is highly variable. Without intensive telemetry studies, it would be impossible to define hunting areas for burrowing owls; we used our general observations and the literature to roughly estimate possible use of areas for hunting. No habitats near the WAGs can be ruled out as possible hunting sites for burrowing owls.

We evaluated nesting habitat out to 200 m from the perimeter fence or out from the edge of lawns, gravel or buildings if no fence was present. This is a minimal distance but we could not evaluate beyond this distance in the time allotted for this survey. Two hundred meters may be sufficient for evaluating potential influences on burrowing owl nesting but there is no data to substantiate this distance. Burrowing owl home ranges from as far as 1 km away may overlap WAG boundaries.

Screening Methodology

Nesting Habitat

We surveyed potential nesting habitat because late summer is not an appropriate time for surveys of nesting burrowing owls. Burrowing owls have dispersed from nesting burrows by mid to late summer. Known observations of burrowing owls near WAGs from our 1996 studies or from breeding bird surveys were included. Habitat patches of 1 ha or larger within 200 m of WAGs were categorized as high use, moderate use, low use, and non suitable habitat for nesting burrowing owls. Patch size was based on actual patch size and not on the portion of a habitat patch within the 200 m distance. Categorization of potential nesting habitat was based on the following characteristics and apply only to the INEEL:

- Optimal use nesting habitat on the INEEL (1):

  These are the best sites available on the INEEL and do not represent optimal nesting habitat for the region. This category includes sites with most vegetation less than 30 cm tall, including heavily grazed areas. These sites are usually dominated by grasses such as cheatgrass (*Bromus tectorum*) or crested wheatgrass (*Agropyron cristatum*) but may also be dominated by winterfat (*Eurotia lanata*). Scattered shrubs such as big sagebrush (*Artemisia tridentata*) often provide perch sites for burrowing owls but generally represent less than 2% of the total ground cover (as measured by the line-intercept method, for example). Other wooden or metal posts or short poles also provide perches and enhance this cover. In this habitat, burrowing owls can readily view movements of medium sized mammalian predators, for example, out to 50 m or more from the mound of soil at the burrow entrance.

- Moderate use nesting habitat (2):

  Area characterized by taller bunch grasses, tumbleweed, and low shrubs or taller shrubs; medium to taller shrubs represent less than 5% of total ground coverage. The owls view of the surrounding ground cover and potential ground level predators from the burrow mound would be less than 10 m in most cases. Also included are disturbed sites such as large excavation areas and disturbed habitat associated with road ditches and seeded grass areas along roads and road ditches. Disturbed road-side habitat was included in this category without regard to patch size as it is more of a habitat corridor. Occasional taller shrubs, fenceposts, or other perching poles enhance this cover for nesting burrowing owls. Small rock outcrops may also provide perches.

- Low use nesting habitat (3):

  Shrub cover, usually of rabbitbrush or big sagebrush with intermixed grass. Shrub coverage of the ground is about 5-10%. A burrowing owl's view of surrounding habitat and ground level predators from the burrow mound would be less than 10 m. Recent burns of one or two years should be included in this category due to blowing soil that destroys burrows and general lack of burrowing activity to develop potential nest sites. Occasional taller shrubs, fenceposts, or other perching poles enhance this cover for nesting.

- Non suitable nesting habitat (4):

  These sites are characterized by shrub cover of over 10% and usually dominated by big sagebrush. Visibility of burrowing owls from burrow mound would generally be less than 5 m. Extensive portions of the INEEL fit this category. This category also includes mowed grass (unless it contains usable burrows for nest sites), asphalt, and areas regularly used around buildings within facility fences.

Hunting Habitat

There is no information on habitat used by burrowing owls to find prey on the INEEL. Our only observations of hunting behavior confirmed that they did use grass dominated habitats to find prey; however, we have very few observations. Any evaluation of burrowing owl hunting habitat with current information is probably highly inadequate. Information needed for this evaluation would require a 2-year study using radiotelemetry techniques to evaluate burrowing owl hunting in relation to habitat on the INEEL. Because of lack of data, all sites were considered as potential hunting areas. We feel relatively safe in identifying grass dominated habitats as higher use hunting areas. The importance of big sage as hunting habitat needs to be evaluated. Jerusalem crickets (*Stenopelmatus* spp.) are a major food item for burrowing owls (Gleason and Craig 1979, Rich 1986) in the intermountain region and are commonly associated sagebrush habitat (Rich 1986).

Methods Used to Map Potential Burrowing Owl Habitat

Rough sketches of each facility and surrounding roads were traced from aerial photos. Beginning at easy access sites on facility perimeter roads, definitive habitats of 1 ha or larger were drawn onto the map as observed from a vehicle or near the vehicle out to 200 m from each WAG perimeter. Facility perimeter was defined as the fence line surrounding each WAG, or if no fence existed, the edge between the desert vegetation and facility buildings, roads, and lawns. Each habitat was labeled with a number for nesting (1-4) habitat corresponding with the habitat criteria listed above. Facility roads, fences, buildings and other landmarks were used to determine habitat boundaries. Shrub cover percentage used to classify habitat suitability was visually estimated. However, prior to visual estimation we used the line intercept method to estimate the actual percent cover of shrubs. To do this we stretched a 25 m tape across the shrub habitat in several sites; we estimated the number of cm of tape the shrub canopy would intercept and divided this number by 2500 cm. An estimate of percent coverage of shrubs is made as follows: total cm of shrub cover/ total cm of measuring tape x 100. After measuring about 10 sites for percent shrub cover, the observer should have a visual image for approximate percent shrub cover without repeated measurement. A periodic check of the observers accuracy in estimating shrub cover is recommended.

Survey Methodology

Because the time at which this survey was conducted was inappropriate for observing nesting burrowing owls (see Screening Methodology, above), we did not attempt such a survey. Following are recommendations for conducting such surveys in the future.

Recommendation for Future Surveys

Owls arrive on the site in early April. The first sighting in 1996 was on April 9. Thus, surveys should begin by mid to late April. A portable cassette player ("boom box") should be used to broadcast the primary "coo-coo" call of the males, the territorial "song" emitted by the males only from the nesting burrow (Johnsgard 1988). Drive the perimeter of each facility, stopping to survey from outside the vehicle every 0.4 km (1/4 mile). Play several calls in succession for 3-4 minutes followed by 1-2 minutes of silence and repeat this pattern. If road systems permit, conduct surveys out to at least 0.6 km from the WAG perimeter as burrowing owl territories will likely cover this distance from the nest burrow.

Responses by the males include vocalization (repetition of the coo-coo call), territorial posturing, flight, "white and tall" stance (in which the white feathers around the eyes and beak become more obvious), alarm bobbing, and copulation (Haug and Didiuk 1993). Responses will decline with progression of the nesting season (Haug and Didiuk 1993).

Daily timing of surveys varies according to the literature. Surveys should not be conducted when winds exceed 20 km hr^{-1} or during heavy rain (Haug and Didiuk 1993). Because springtime weather conditions on the INEEL often include relatively still mornings with high winds occurring later in the day, and because binoculars should be used to scan the area during broadcasting, we recommend surveys beginning in the predawn light and continuing until approximately 10:00 AM.

Each facility should be surveyed at least once and, time permitting, a second survey should be performed during mid to late May to catch birds that previously did not respond and late nesters. Response rate of the birds is not 100%. Some males may not respond to broadcast calls at all or some may respond in a subtle manner that allows them to escape detection (Haug and Didiuk 1993); thus the need for binoculars to augment the search.

Habitats rated as optimal use or moderate use nesting habitat should be intensively searched by walking transects approximately 50 meters apart. When an owl is detected, the burrow can usually be found by walking toward the bird and flushing it. Burrows with burrowing owl sign should be recorded with a GPS unit.

All burrows of sufficient size for burrowing owl use should be checked for owl droppings, manure (used to line burrow openings), and regurgitated pellets; if these are found it is likely an active nesting burrow. Pellets are usually about 5-10 cm long and characterized by insect exoskeletons or some fur and bone from small mammals; insect parts are usually more prominent than small mammals during nesting. Burrows of sufficient size are greater than approximately 15 cm wide and usually have a vegetation free mound of soil or subsoil around the burrow opening.

The observer should also look for burrowing owls perched on fences, posts, road signs, or other high points during breeding season surveys. Burrowing owls on posts or fences will commonly fly from the lookout to the nesting burrow entrance as the observer approaches. Burrowing owls will sometimes nest in roadside ditches where the habitat is linear (roadside only); roadside nesting birds can often be observed perching on tall objects such as a sign or small post near the road.

Surveys using breeding season calls are generally ineffective after mid June. Surveys for active burrows using transects and direct examination of potential nesting burrows can continue through July.

Raptors

Purpose and Scope

This survey evaluated potential nesting and wintering use of INEEL WAGs by bald eagles, peregrine falcons, northern goshawks, and ferruginous hawks. Field studies were not conducted. Estimates of use were primarily based on 1991-1993 data on raptor use of the INEEL collected by Richard Hansen and Lester D. Flake (Hansen 1994).

Limitations

Nesting and wintering populations of raptors near WAGs could not be directly surveyed because neither nesting nor wintering were occurring during of the time of year the surveys were conducted. Short term surveys of raptors near facilities would be less representative than the recent data collected on the INEEL (Hansen 1994). However, the studies by Hansen (1994) were for the entire INEEL and required interpretation relative to individual WAGs. This increased the uncertainty of the predictions.

Information from the literature was used to evaluate the potential for the home range of nesting ferruginous hawk pairs from 1991-1993 to overlap WAGs. Ferruginous hawks tend to reuse old nests but the use of different nest sites and lack of use of old sites also occurs and could not be evaluated in this survey.

It is possible, although not probable, that ferruginous hawks could nest in trees or appropriate tall structures associated with facilities. It is also possible that peregrine falcons could nest on or near physical facilities as they have nested on bridges and buildings in some metropolitan areas.

Screening Methodology

Ferruginous hawks feed in open areas and tend to seek isolation from human activity. Thus there should be no actual use of areas within WAGs with the exception of occasional use of drinking water from nearby wastewater ponds or possible predation on vertebrates using wastewater ponds. Peregrine falcons and bald eagles are not known to nest on the INEEL at this time but have been observed by Craig (1979) and Hansen (1994). Habitats on the shrub desert portions of the INEEL within which the WAGs are located are unsuitable for nesting northern goshawks and Hansen (1994) did not observe this species. Craig (1979) observed northern Goshawks on the INEEL during winter.

Survey Methodology

Surveys of the target species were inappropriate during the short period in late summer in which the surveys were required. This period missed wintering and nesting altogether. In addition, short term surveys can be highly misleading in terms of raptor use of areas. Thus, seasonal occurrence of bald eagles, peregrine falcons, and ferruginous hawks was taken from recent work conducted on the INEEL (Hansen 1994) and to some extent from earlier work by Craig (1979). Occurrence of nesting and nest site locations was taken from Hansen (1994). Occurrence at wastewater ponds by these raptors was taken from recent work completed on bird use of wastewater ponds (Cieminski 1993). We estimated the possible overlap of home ranges of nesting target species with WAGs from known locations (UTM coordinates) of 1991-1993 nests and home range estimates from published literature. Potential use of WAGs by raptors was estimated based on the distribution of these raptors in the 1991-93 INEEL studies along with general behavior patterns in terms of feeding, perching, or nesting near human activity on the INEEL.

Methodology for past Surveys and Recommendations for Future Surveys

<u>Nesting surveys</u>: Surveys of raptors are not recommended without training and experience in raptor identification. We recommend that surveys be conducted by a trained ornithologist with some previous experience in raptor identification.

Search specifically for ferruginous hawks.

There is no need to search for nests of peregrine falcons, bald eagles, or northern goshawks in areas near WAGs because it is unlikely these species will be found nesting on the INEEL. Nesting begins in early to mid April for ferruginous hawks on the INEEL but we recommend searching in late May and June to avoid causing abandonment during the laying period.

All areas within a 6-km radius of WAGs should be searched. Conduct the search by driving the various fire trails and other roads and inspecting potential sites using binoculars or a spotting scope. Remote areas from roads should be searched by walking. Nests are large and often conspicuous although vegetation will obscure some nests from a distance. Observation of a single ferruginous hawk flushing from a tree is often an indication of nesting nearby. Circling and calling by ferruginous hawks is an indication of the presence of a nest. Our studies indicate that ferruginous hawks on the INEEL will be nesting in junipers, cottonwoods, or on platforms constructed for nesting hawks. Despite extensive searches , no ground nests were found by Hansen (1994). Known nest sites should be checked because ferruginous hawks often use old nests year after year. Nests should not be approached frequently nor, unless necessary, too closely. Nests with nestlings near fledging should not be approached because young may be forced from the nest. Cautionary guidelines are proposed by Fyfe and Olendorff (1976).

Using a geographic positioning system (GPS), record the coordinates of nest sites. The location of large stick nests, often lined with juniper bark, should be recorded even if not active because they may be used in subsequent years.

Data recorded will depend on the objectives of the survey. For example, Hansen (1994) maintained records on nest substrate, nest stage (laying etc.), fledging success, fledging dates, and post fledging descriptions of the actual nest, as well as several other descriptors. At a minimum, the species, date, location in UTM coordinates, type of nest substrate (juniper, cottonwood, etc.) should be recorded.

Nests should not be revisited unless necessary to fulfill the objectives of the study.

Wintering and migratory surveys: Wintering surveys and migratory raptor surveys are probably best conducted by roadside counts in the vicinity of the WAGs. Long term studies for a larger portion of the entire INEEL should be conducted on survey routes reported in previous studies (Hansen 1994). Training and experience as well as suitable binoculars and a spotting scope with a window mount are recommended.

Surveys to 5 km from the WAGs would include most raptors with activity patterns and home ranges likely to overlap WAGs. Surveys should be standardized so that the same routes are driven under similar time and weather conditions. Surveys should not be conducted when either snow or rain are falling. Routes confined to paved highways can be driven all year long. Travel should generally be under 30 kph to allow for observation of raptors from the vehicle. However, if longer routes are regularly used, such as the circuit route described in Craig (1978) and Hansen (1994), higher road speeds may be necessary.

Hansen (1994) conducted surveys from 0800 to 1500 MST which provides a broad time span. Surveys at two week intervals are recommended from mid September through March. However, an early fall, mid winter, and early spring sampling period is probably more realistic. Sampling frequency could be increased if sampling is restricted to shorter periods. Wintering raptors are often observed on telephone and power poles along paved highways. Larger raptors such as bald eagles may feed on road-killed pronghorn or jackrabbits associated with highways. Winter and migratory raptor surveys should be conducted in conjunction with studies of other raptors on the INEEL because ferruginous hawks are absent during most of the winter and the other target species are rarely observed on the INEEL.

Breeding Birds

Purpose and Scope

This protocol describes an approach to determine whether nine species of birds have historically used habitats surrounding WAGs on the INEEL. The birds of interest are all listed as species of concern by state or federal agencies and include trumpeter swan (*Cygnus buccinator*), black tern (*Chlidonias niger*), loggerhead shrike (*Lanius ludovicianus*), long-billed curlew (*Numenius americanus*), bald eagle (*Haliaeetus leucocephalus*), peregrine falcon (*Falco peregrinus*), ferruginous hawk (*Buteo regalis*), northern goshawk (*Accipiter gentilis*), and burrowing owl (*Athene cunicularia*). Breeding Bird Survey (BBS) data for facility routes at the INEEL was examined to determine usage.

Limitations

Although BBS data can be used to determine historical presence of species at a WAG and can provide information about historical trends in populations, they cannot provide absolute population density information. Also, these data provide information about presence of species at a particular time in a particular year or set of years. If the habitat around a given facility has changed, the data may or may not represent current bird populations. As with any survey methodology, BBS cannot demonstrate with certainty the absence of a species. However, because these data encompass several years, the combined results provide confidence that, if the species were present during the time of year the survey was conducted, it would have been detected.

Screening Methodology

The BBS routes focus on facilities without reference to habitat. No screening methodology was applied.

Survey Methodology

The BBS was started in 1966 in the eastern United States, where it was designed to detect changes in the populations of bird species. Since its beginning, the BBS has grown into a roadside route survey of avifauna in both the United States and southern Canada which now has over 3000 routes. The U.S. Fish and Wildlife Service uses the BBS to observe the trends of bird populations across the U.S. and Canada. The standardized methodology of this survey makes assessments of national, regional, and local trends possible (Belthoff et al. 1996).

The BBS was started on the INEEL in 1985. At this time 13 BBS routes were established. Five of these were 40 km routes which covered remote areas of the site. The remaining eight routes were shorter, averaging 8.5 km, and were around facility complexes on the INEEL. Each June and early July, between 1985 and 1991, all of the 13 routes were surveyed for birds. Investigators drove or walked the routes and stopped at intervals along the way. For the longer remote routes, stops were every 0.8 km. The shorter facility routes had stops every 0.32 km (Belthoff et al. 1996). At each stop, the number and species of individual birds seen in the 3 minute observation time was recorded.

For this assessment, we analyzed BBS data collected by the Environmental Science and Research Foundation on the INEEL facility routes during the period 1985-1991 (Belthoff et al. 1996) and 1996. The data allowed us to determine whether the species of interest were observed during the period and to infer trends.

BBS data do not allow absolute estimates of population size. However, for this report, we estimated the population density of the birds in question as follows. The standard BBS methodology requires surveyors to count all birds within 400 m of each stop. The area surveyed on each route was a string of adjacent circles, each 0.5 km^2 in area. For the BBS routes around facilities, the distance between stops was decreased to 320 m and the area surveyed was a string of adjacent circles, each 0.07 km^2 in area. We calculated the total area surveyed as the number of stops on each route multiplied by the observation area per stop. The density was then estimated as the average number of observations per year (total number of observations divided by the number of survey years; 10), divided by the total area surveyed.

Sagebrush Lizard

Purpose and Scope

The following protocol describes a visual encounter survey for sagebrush lizards (*Sceloporus graciosus*) around the WAGs of the INEEL. The purpose of this survey was to determine whether this species could be affected by potential contamination at the WAGs. We primarily accomplished this goal by determining whether or not sagebrush lizards occurred around the perimeter of the WAG survey locations. In most reptile surveys, it is difficult to determine if a species is not present in a certain locality; however, sagebrush lizards are territorial and are easily observed if surveyed for during the correct times of the year.

Limitations

This survey method was not comprehensive enough to make determinations of population size and densities of sagebrush lizards. The information obtained through this survey only applies to the WAG areas surveyed, and should not be applied to other areas of the INEEL. Sagebrush lizards are capable of dispersing into an area, so any information that suggests that the lizards do not inhabit a certain WAG locality should not be projected to future lizard distributions. Potential contamination of this species could vary widely according to the extent of WAG contamination, including the distance away from the WAG that the contaminants spread and the concentration of the contaminants.

Screening Methodology

Because these lizards are found in most of the habitat types on the INEEL (Stebbins 1985), an initial habitat survey was not warranted. However, sagebrush lizards are not known to occur in grass lawns, so locations around the WAGs that have planted and maintained lawns were not surveyed. Neither the facility buildings, nor the wetland areas (sewage ponds, cooling ponds) of the WAGs were surveyed. The survey covered the area just outside of the boundary of each WAG, whether that boundary was a fence or the area in which lawns are no longer maintained and watered. Due to the wide range in size of the WAGs, the actual time to survey each WAG varied, with the smaller WAGs taking one day, and the larger WAGs taking up to two days.

Survey Methodology

We began our search at a convenient area at the WAG site, such as a parking lot near the edge of the site. We arrived at each area to be surveyed at 0900 and recorded date, time, weather, and temperature in a field notebook. In order to identify our starting point, we flagged a location 10-m away from the WAG boundary. Then we began walking the perimeter of the WAG slowly, visually searching the area. We were able to visually sweep 5 m to either side of our path.

When a sagebrush lizard was observed, we attempted to determine the approximate size/age and sex, if possible. Age categories used were adult, juvenile, and hatchling. Males were identified by blue stripes along their sides, and blue mottling on their throats. Females are slightly larger than males and may have reddish-orange mottling along the sides and throat.

We recorded the locations of the lizards as we observed them using a GPS receiver that collects differentially correctable files. Because of the accuracy of corrected GPS locations, observations within 5 meters of one another were considered the same location.

At each of the cardinal directions around the WAG (determined beforehand in UTM locations digitized from INEEL maps), the site was flagged and we began a transect. We walked toward the cardinal direction (N, S, E, or W) for 100 m (measured by pacing or a measuring tape), visually searching to the right and left. At the100-m mark, we walked a transect back 15 m to the right from the outgoing transect. We recorded all lizard locations along both sides of the transect.

When the first cardinal transect was completed, we continued walking the perimeter of the WAG until we arrived at the next cardinal transect location. This was repeated until all four cardinal location transects were completed and we arrived back at the starting point.

Some of the larger WAGs required two observers, and the transects were divided between the two people. Both people began at the same location, and one proceeded clockwise while the other walked counterclockwise. The two persons will met at the opposite end of the circle when the perimeter search was completed.

All surveys were terminated by 1300 hours, because at this time the lizards are not as active. The lizards have average peak activity times from 0900-1300 (Guyer, 1978; Guyer and Linder, 1985).

If time remained after the perimeter search, a time-constrained survey was conducted. We identified areas within 100 m of the boundary that looked like the best sagebrush lizard habitat and searched them for 1 hour. The time-constrained searches were conducted in locations that were not included in the initial perimeter walk. Areas such as rocky outcrops and sagebrush flats are good sagebrush lizard habitat, although this species can be found in a wide variety of habitats.

If no time remains for a time-constrained search after the perimeter search, the time-constrained search should be conducted at a later date.

Each site was visited at least once to determine if lizards were present and a second time if they were not detected on the first visit. On the second visit, the time-constrained search was done first, and if no lizards were seen, the perimeter walk was repeated. If the time-constrained search revealed lizards on the second search, the survey was concluded.

To try to account for the effects of variation in environmental conditions on lizard activity, a reference site was be surveyed from 0900 to 1300 at the beginning and end of the study period. We chose Guyer's survey site (just south of the Rattlesnake Cave junction) as our reference site because sagebrush lizards are known to occur in that location. On survey days with unusual weather conditions (e.g., cool, rainy, or very windy), the reference site was searched for about 1 hour to determine if lizards were active under those conditions. If lizards were not observed at the reference site under these conditions, the WAG site was surveyed at a later date, under more normal weather conditions.

This survey methodology is appropriate from mid-May through August, which is the time period when the lizards are most active. However, the activity times for the lizards may shift slightly depending upon seasonal temperatures and daily weather patterns. The survey distances (10-100 m around each facility) reflect the sagebrush lizard's home range, which is typically less than 3500 m^2 (Guyer 1978, Guyer and Linder 1985). This survey method is a good system for detecting whether sagebrush lizards occur around the facilities, however, it is not well-suited for population estimates.

Bats

Purpose and Scope

The following protocol describes acoustical and visual encounter surveys for Townsend's big-eared bats (*Corynorhinus townsendii*), long-eared myotis (*Myotis evotis*), small-footed myotis (*Myotis ciliolabrum*), and western pipistrelle (*Pipistrellus hesperus*) around designated WAGs of the INEEL. The purpose of this survey was to determine whether these species could be affected by potential contamination at the WAGs. This survey accomplished this goal by determining whether or not these species of bats use WAGs for roosting or obtaining water to drink.

Limitations

This protocol describes a survey methods that are not sufficiently comprehensive to estimate population densities or size for these species of bats, although relative abundance estimates can be made (Ahlen 1980, 1990). Survey results apply only the WAGs surveyed, and should not be extrapolated to other areas of the INEEL. Because bats are capable of utilizing a relatively large area, absence of particular species do not necessarily indicate that the taxa in question do not use the area(s) in other times of the year. Potential contamination of bats may vary widely according to the extent of WAG contamination including the distance away from the WAG that the contaminants spread, concentration of contaminants, and ingestion of contaminants while drinking.

Screening Methodology

Because all four species of bats in question occur on the INEEL (Bosworth 1994, 1996; Keller et al. 1993, Wackenhut 1990), an initial habitat survey was not warranted. The most likely use of WAGs by these bats was open sources of water for drinking and feeding on insects, light sources that attract insects, and buildings that may have been used as night or day roosts. These surveys did not consider either grass lawns or sagebrush-steppe habitat because all four species of bats in question take insects on the wing and the most likely sites for this activity are lighted areas or over open water. Bosworth (1996) observed bats over water on the INEEL, but no species determinations were made.

Townsend's big-eared bat is not associated commonly with man-made structures (Kunz and Martin 1982), nor has it been captured over open water sites on the INEEL (Bosworth 1996). Therefore, it is unlikely that this species is associated with WAGs.

Due to the range in size of WAGs, the actual time to survey each WAG varied. Smaller WAGs required one evening, but larger WAGs required 2 days.

Survey Methodology

Surveys began at sunset and continued until about 0100 hours following a protocol outlined by Hickey et al. (1996). Searches began at a convenient area at the WAG, preferably at a source of drinking water because bats commonly drink prior to feeding bouts. Surveys shifted to lighted areas as the night progressed. Where possible, searches for day roosts were conducted at man-made structures from 0900 until 1200 hours.

For night surveys, investigators arrived at each area to be surveyed at least 30 min. prior to sunset. Date, time, weather, and temperature were recorded in a field notebook. Equipment to record bat echolocation calls was set up and tested. Investigators positioned themselves near sources of water and pointed microphones toward water sources at roughly a 45° angle from the substrate. Microphones were swept in a 360° arc every 2 min. These surveys were conducted while on foot or in a motor vehicle. When possible, perimeters of open water sources were surveyed. Any vocalizations detected were recorded on a tape recorded for laboratory analysis (the Anabat II detector begins recording automatically and records the time when an ultrasonic pulse is detected). Investigators also took notes regarding preliminary identifications of bats encountered (Gannon and Foster 1996). These determinations were based on the size and flight behavior of the bats encountered visually.

A GPS receiver was used to record locations. Because of the accuracy of corrected GPS locations, observations within 5 m of one another were considered the same site. Surveys were terminated by 0100 hrs, at which time bat activity was much reduced.

This survey methodology is effective from mid-April through mid-October, which is the time period when most nights are sufficiently warm and bats are active. However, some evenings during this time period may be sufficiently cold (usually less than 10° C) to preclude bat activity.

Merriam's Shrew

Purpose and Scope

The following protocol describes a pitfall trapping survey for Merriam's shrew (*Sorex merriami*) near WAGs of the INEEL. The purpose of this survey was to determine whether this species could be affected by potential contamination at the WAGs. This survey primarily accomplished this goal by determining whether or not Merriam's shrews occur near WAG survey locations. It is normally difficult to determine whether or not this shrew is present in a certain locality. Merriam's shrew is associated with sagebrush, however, it is uncommon throughout its range (Armstrong and Jones 1971).

Limitations

This protocol describes a survey method that is not comprehensive enough to make determinations of population size and densities of Merriam's shrews. Information obtained through this survey only applies to the WAGs surveyed, and should not be extrapolated to other areas of the INEEL. These shrews are capable of dispersing into an area. Moreover, most trapping methodologies underestimate or miss shrews when in fact they are present (Sarah George, pers. comm.). Therefore, any information indicating that Merriam's shrews do not inhabit a certain WAG locality should not be projected to future shrew distributions. Potential contamination of this species could vary widely according to the extent of WAG contamination, including the distance away from the WAG that the contaminants spread and the concentration of the contaminants.

Screening Methodology

Because Merriam's shrews have been collected on the INEEL, an initial habitat survey was not warranted. However, Merriam's shrews are associated with sagebrush and are not known to occur in grass lawns, or in man-made structures, so locations around the WAGs that have planted and maintained lawns were not be surveyed. Neither the facility buildings, nor the wetland areas (sewage ponds, cooling ponds) of the WAGs were surveyed. The survey was conducted in appropriate sagebrush habitat just outside of the boundary of each WAG.

Survey Methodology

Each WAG perimeter, as well as interior where appropriate, was searched on foot to determine optimal site(s) for pitfall traps. Optimal sites were determined by proximity to mesic microhabitats and sagebrush. Because pitfall traps used together with drift fences is the best method for sampling shrews (Kalko and Handley 1992, Kirkland and Sheppard 1994, McComb et al. 1991), one or more stations were installed at selected WAG locations. Each pitfall station consisted of four 4-gallon plastic buckets buried to the rim in the substrate. One of the four buckets was the center of the array. The other three were placed 10 m apart and arranged in a circular fashion. The three perimeter buckets were connected to the central pitfall with black plastic sheeting, also buried about 10 cm deep in the substrate and supported by 2" X 2" wooden stakes. The plastic sheeting radiated from the central pitfall trap at angles of 120°. Each pitfall bucket was lined with cotton for insulation. In addition, about 10-15 live meal worms were left in each trap to serve as a food source. Because shrews are primarily nocturnal, the pitfall arrays were checked within two hours after sunrise.

This survey methodology is effective during periods of time when there is no snow cover. Shrews are active year round, but snowfall will inhibit monitoring (Merritt 1995).

Gray Wolf

The gray wolf (*Canis lupus*) originally occurred on the Snake River Plain, which includes the INEEL. It may re-occupy areas where a vulnerable prey base exists and where human conflicts are minimal, as populations build in the wilderness areas further north. Concern exists over the potential for radioactive contamination of wildlife that may frequent INEEL facilities. Wolves are highly unlikely to frequent installations where the human presence is high, which includes WAGs 1-9. However WAG 10, the rangelands away from installations, have a minimal human presence and a prey base which makes them potential wolf habitat.

Purpose and Scope

This protocol describes the conduct of a biological assessment to determine the likelihood that gray wolves will become contaminated by using habitat associated with the INEEL WAGs. Because of the low probability that wolves currently use such habitat, this assessment will consist entirely of a literature and record search. No assessment was completed for individual WAGs. Instead, a single assessment for the entire INEEL was completed.

Limitations

This assessment did not include field surveys for gray wolves. Thus, it is possible, although unlikely, that evidence of current use by wolves may have been missed. Although every effort was made to be comprehensive, it is possible that we missed a crucial piece of evidence in the literature or anecdotal evidence. Given these limitations, and the probability that wolves historically inhabited the eastern Snake River Plain, this assessment cannot categorically conclude that there is no possibility of wolves becoming contaminated at a WAG.

Screening Methodology

Habitat for wolves includes the presence of a prey base and levels and kinds of human activity that may be tolerated. The actual vegetation complex is likely less critical, given that the wolf originally occupied most of North America and a wide variety of habitats. Literature was reviewed to determine whether occupation of INEEL rangeland away from installations is probable, and assumptions that are involved for this to occur.

Survey Methodology

A field assessment to determine whether wolves are present or not on INEEL is unlikely to be useful. Field people who study aspects of the facility's rangelands and others who spend time on them, would have likely observed carcasses of deer, elk or antelope killed by wolves, since these carcasses tend to be readily observable. Ravens, magpies and other scavengers tend to concentrate on these carcasses and are easily observed. Evidence of wolves through tracks and scats would be observed on the trails that occur across INEEL rangelands.

All available information on past use of the INEEL and surrounding area by the gray wolf was examined and summarized. Information on dispersal distances and movements of currently radio-collared wolves was reported to aid in projecting the likelihood of wolves occurring on INEEL. Information on the prey base was included to demonstrate the presence of big game. The survey was limited to a literature and record search, with interviews of knowledgeable individuals as needed.

Historical records are always subject to interpretation and opportunities to corroborate and verify them are limited. Knowledge of the original range of the gray wolf and the associated prey base was used to aid the assessment of the record.

A significant amount of information has been developed on the gray wolf in Idaho pursuant to the current restoration effort. A number of agency reports are available, as well as published information, for review. These include the recovery plan and environmental impact statement that was produced as part of the ongoing restoration effort.

Pygmy Rabbit

Purpose and Scope

The purpose of this survey was to determine the likelihood of the presence of pygmy rabbits in areas immediately adjacent to the WAGs on the INEEL. The survey protocol consisted of a two phase approach. The first phase was designed to determine the likelihood that a given WAG is located in appropriate pygmy rabbit habitat. The second phase involved intensive field surveys of the WAGs found in areas of appropriate habitat.

Limitations

The limitations of the first phase of the survey included the possibility of exclusion of a WAG that may have contained potential pygmy rabbit habitat. This exclusion could have result from two factors. The initial determination of whether WAGs contain potential habitat was based on Geographic Information System (GIS) computer files for vegetation and geology. If these files were inaccurate, it could have lead to an error in assessing the area around a given WAG. The second possible source of error was in the reliability of the habitat suitability model. Though these errors exist, they were likely minimal. The GIS overlays have proven to be highly accurate regarding geology and habitat characteristics. The previous work with determining areas not used by pygmy rabbits based on these two overlays has also proven to be highly accurate. Of 30 randomly chosen sites predicted to be non-use areas, field surveys have failed to find evidence of rabbits in all sites.

The accuracy of the second phase of the work, field surveys of WAGs containing potential habitat, is limited by several factors. WAG areas may have rabbits at very low densities or have had them some time in the past. Field surveys of such short duration cannot be thorough enough to document animals at very low numbers. Likewise, rabbit populations are known to fluctuate. At the time of the survey, field data indicated that rabbits in general were at a low level. WAGs may contain pygmy rabbits during high population numbers but not at lower levels. However, pygmy rabbit sign, burrows and scats, remain in an area for several years which tended to reduce the chance of misclassifying an area as not used by pygmy rabbits.

Because of the limited time available for surveys and the fluctuations in rabbit numbers, if no pygmy rabbit sign was found in the vicinity of a WAG determined to contain possible pygmy rabbit habitat, there was an undeterminable degree of uncertainty about whether they were current or former inhabitants of an area.

Screening Methodology

The screening methodology for the first phase of this work involved examining the GIS habitat and geologic overlays of the various WAGs. Gabler (1997) determined that specific combinations of habitat and geographic features (big sagebrush on lava) are reliable predictors of possible pygmy rabbit occupancy. WAGs that did not contain the appropriate combination of features, were excluded from further survey. The remaining WAGs were analyzed further with field surveys.

Survey Methodology

The field surveys at sites determined to potentially contain pygmy rabbits were conducted as follows. We established survey lines by superimposing North-South transect lines 100 m apart on a map of the area surrounding each WAG. The began 200 m beyond the WAG perimeter and ran the length of the survey area, with appropriate breaks for buildings and parking lots, to 200 m past the WAG perimeter. We determined the starting point (N or S end) of the initial line based on UTM coordinates from the maps and map features, e.g. fence corner, road intersection, etc. The starting points of the remaining lines were measured from this initial line with a tape measure or by pacing. Starting points were marked with flags.

Each line was walked in a northerly or southerly direction, as determined by a hand held compass, to the appropriate end point, as determined from the map lines. While walking along the prescribed lines, the surveyor looked along the line of walk and from side to side for evidence of pygmy rabbits.

Evidence of rabbits consisted of actual sightings of rabbits, their burrows, and/or their scat. If rabbits were sighted, we determined their species by the presence (cottontail rabbit) or absence (pygmy rabbit) of a white tail. Pygmy rabbits are the only rabbit species that digs burrows so burrows of at least 17-cm diameter constituted evidence of the species possible presence. The area immediately surrounding such burrows was searched for rabbit scat. If we found rabbit scat of 0.4-0.5 cm diameter (cottontail scat is 0.8-1.0 cm in diameter), we concluded that the species was there. The exact location of the confirmed sites was determined with a differentially correctable GPS receiver.

Pygmy rabbits are a diurnal species and can be active at all times of the day (Heady et al. 1995) and year. Their burrows and scats will always be observable. Consequently, there are no time of day, seasonal, or weather constraints for this survey protocol. If surveying is to be done in the winter, one can use the presence of pygmy rabbit tracks in the snow as additional evidence of rabbit presence. The length of the hind foot of pygmy rabbits is 6-7 cm (cottontail hind foot length is 9-11 cm).

Plants

Purpose and Scope

The following protocol is for a visual search for 4 T&E vascular plant species around the WAGs on the INEEL. The species of concern are Lemhi milkvetch (*Astragalus aquilonius* (Barneby) Barneby), plains milkvetch (*Astragalus gilviflorus* Sheld.), wing-seeded evening-primrose (*Camissonia pterosperma* (S. Wats.) Raven), and spreading gilia (*Ipomopsis polycladon* (Torr.) V. Grant). This survey accomplished the goal by identifying the presence or absence of suitable habitat and of the individual species around the WAGs.

Limitations

This protocol describes a survey method that determines the presence or absence of the four cited T&E species or their suitable habitat. The information derived from this study is applicable only for the surveyed WAG areas and can not be applied to any other INEEL areas. Plant propagules can be dispersed many miles into any suitable habitat. Therefore, the absence of the species at this time can not be assumed to predict future occupations of suitable habitat. Determining any other ecological data (e.g. cover, density, frequency, and abundance) entails further study with different protocol and time factors.

Screening Methodology

Because of the habitat requirements of the T&E species in this survey, many of the areas within the WAGs did not require survey. These included areas of cultivation (lawns and other seeded areas), bare gravel sites, wetland areas (sewage ponds and cooling ponds), and facility buildings. The survey for the plant species covered the area outside and around these exclusion areas of each WAG. Due to the wide ranges in size and habitats of each WAG the time to survey each WAG varied. The smaller WAGs (2, 3, 5, and 9) were all done in 1 day while the larger WAGs (1, 4, 6, and 7) took 2 days in total.

Survey Methodology

The T&E plant search followed the procedures of an "Intuitive Controlled Intensity Level Survey" as documented by the U.S. Department of Agriculture (USDA), U.S. Forest Service (1991). By this method, transects across the whole site area and the perimeter are walked so all habitats are identified and then specifically visited and searched.

The process began by starting at an identifiable point, such as where the vehicle is parked. A transect was then slowly walked along the perimeter, keeping notes of the habitat and species seen. By looking from side to side, the presence of any different habitats was noted. These different habitats were then visited by altering the straight line of the transect to include these in the walk through. This resulted in a zig-zag transect covering a definable width. Depending on the topography and plant cover this transect encompassed a width of 10 to 25 meters. It was wider in flat areas with low vegetation as found in some of the playa-like areas of the INEEL.

This procedure was followed in concentric, circular areas until the survey area was covered. When suitable habitat for a T&E species was found during the walk-through transect, this area was intensively surveyed by walking throughout the area searching between and under shrub cover for any signs of the plant, including live plants, dried, standing stems from earlier in the year, or remains of plants from current or past years (e.g. broken off stems, old fruit.)

The location of suitable habitat or evidence of the target T&E species was recorded by GPS and later differentially corrected. Notes on the habitats and species present throughout the survey were recorded to determine, from associated species and habitats, whether the T&E species might have been possible in the area but were not observable because of the time of year or some other environmental condition.

This protocol is effective from late May through September, depending on the year. The amount of precipitation determines if annual species germinate in any specific year. This survey will determine the presence or absence of species but will not give any specific population data.